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**Unit 3.1 Exam KEY**

AP Biology

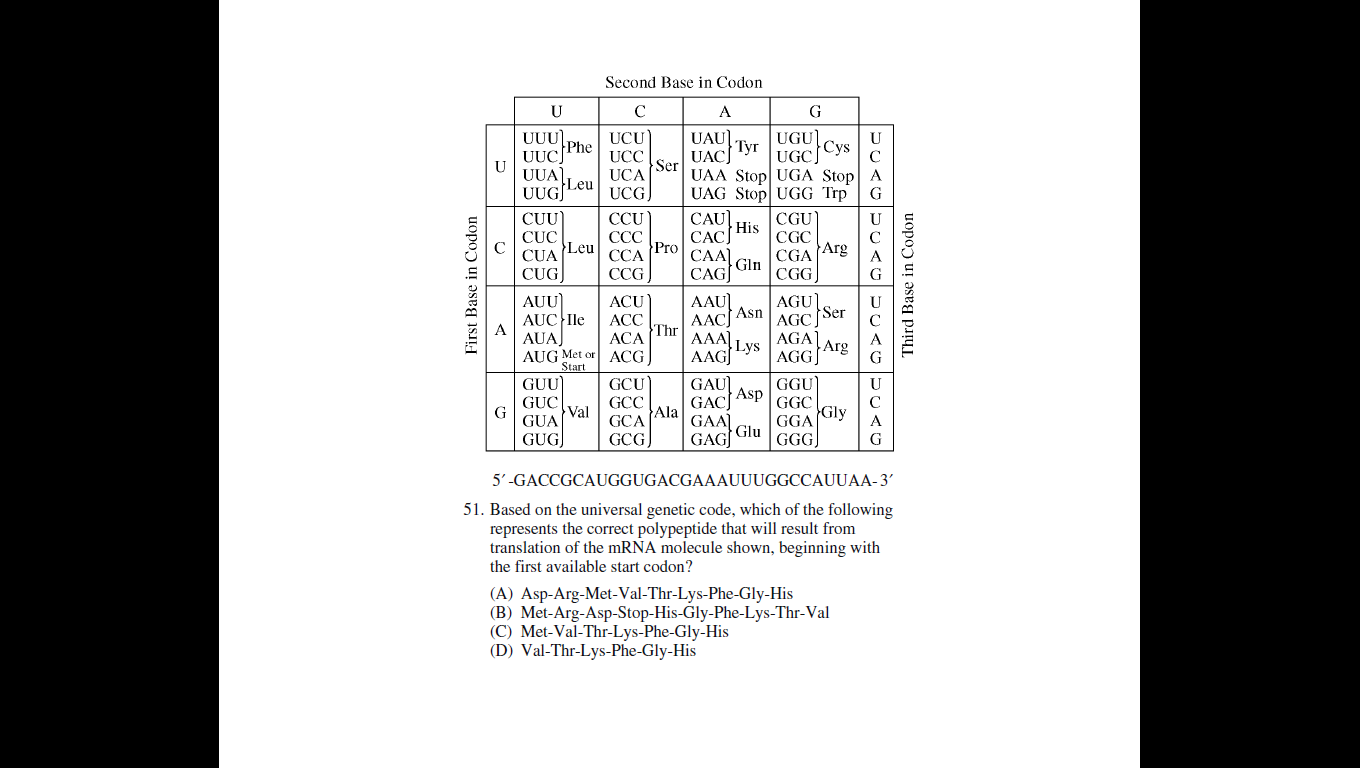
2017 - 2018

This exam will be returned to you so be sure to annotate it while testing so you can understand any misconceptions when it is returned to you for review.

There are 3 multiple choice questions and 1 free response question.

The exam must be completed within the class period

1. The sole genetic material of certain viruses is sometimes RNA, going against the typical idea that all living things contain DNA as their genetic code. Upon studying numerous viruses, which of the following would be an appropriate question to determine the identity of their genetic material?
   1. Do the viruses only infect human hosts?
   2. Are there distinct 5’ & 3’ ends to their genetic material?
   3. Are there both purine and pyrimidine nitrogen bases?
   4. How many oxygen atoms are in the 5-carbon sugar?
2. Polymerase Chain Reaction (PCR) is a useful tool in biotechnology. A crucial procedure involves elevating the temperature to a certain point and then lowering the temperature in cycles, known as thermocycling. What is the most likely role of thermocycling?
   1. Heating allows the phosphodiester bonds to break and cooling reforms them.
   2. Heating promotes breaking of hydrogen bonds and cooling promotes their reformation.
   3. Heating destroys bacterial enzymes that could interfere with PCR.
   4. Heating improves the rate of DNA transcription & translation.



**C**

Free Response

The gene *p-AZN*, occurring naturally in some plant species, codes for a protein hormone that is excreted onto the surface of their leaves. The protein contains a large number of lysine amino acids, which are positively charged, thought to interfere with the nerve cell proteins of insects which are negatively charged. In an attempt to improve crop yields, horticultural scientists performed a transformation experiment where they inserted the *p-AZN* gene into the DNA of a species of corn to make them resistant to damage from insects. The team then extracted samples of the corn DNA, corn leaf surface protein and nerve protein from an insect that had fed on the corn leaves from the experiment. On the electrophoresis diagram on your answer sheet, there are 3 loading wells (A, B & C) in the center of a gel and the regions where a negative current and a positive current would be applied are shown. The corn DNA sample was loaded into well A, the corn leaf surface protein sample was loaded into well B and the insect nerve protein sample was loaded into well C.

1. On the electrophoresis diagram, **draw an arrow** to indicate the direction of each sample’s movement from wells A, B & C through the gel if the transformation was successful. **Provide reasoning** for your placements of each arrow.
2. **Identify** the site of the hormone’s production and **describe** TWO subsequent steps for it to reach its destination.
3. Suppose the scientists also inserted this gene into a bacterium. **Describe** ONE difference and ONE similarity between the corn and the bacterium during their processes of:
   * DNA Replication
   * Gene Expression
4. Not including the information from the prompt above, **Identify** TWO products of genetic engineering that are beneficial. For each of the products also **evaluate** a potential risk.

a. **A- corn DNA & C – Insect protein both negative so will move towards the positive direction. Corn protein is positive so will move towards the negative direction. Opposite charges attract.**

b. **Hormone produced in Rough ER since it is an excretory protein. It will be modifies by the Golgi, packaged into a vesicle, & exocytosed form the cell.**

c. **DNA replication would take less time for a bacterium because less DNA & would have a single origin of replication rather than many in eukaryotes. Both would use DNA polymerase, helicase, etc. enzymes for replication.**

**Gene expression would happen all in the cytoplasm for bacteria but transcription would happen in nucleus for eukaryotes. Also there would be eukaryote modifications (exon splicing, etc.) not seen in prokaryotes. Both would utilize ribosomes for translation & RNA polymerase for transcription.**

d. **Oil-eating bacteria – can remediate oil spill damage/could impact ecosystems by changing food webs/nutrient cycling.**

**Transgenic animals – increase food supply, make food hardier/ could pose unseen risks such as cancer.**